



Concrete Waterproofing by Crystallization™

Concrete Durability Enhancement by Crystallization™

**PLASTIC AND HARDENED STATE PROPERTIES OF
XYPEX ADMIX C-SERIES (C-1000NF)
MODIFIED COMMERCIAL CONCRETES**

Joint Research Project by

The Australian Centre for Construction Innovation, UNSW & Xypex Australia

By Gary Kao
B.Mat.E, M.Sc
Research Engineer

<u>0</u>	<u>28-08-2004</u>	<u>Issued for Information</u>	<u>GK</u>	<u>GJ/GB</u>
----------	-------------------	-------------------------------	-----------	--------------

TABLE OF CONTENTS

1	INTRODUCTION	3
2	MATERIALS	3
3	TEST RESULTS AND DISCUSSIONS	4
3.1	Slump (AS1012.3)	4
3.2	Setting Time (AS1012.18)	4
3.3	Compressive Strength (AS1012.9)	4
3.4	Drying Shrinkage (AS1012.13)	5
4	CONCLUSIONS	5

1. INTRODUCTION

In accordance with Xypex Australia's ongoing commitment to research and development, further research has been undertaken to evaluate the impact of the addition of Xypex Admix C-Series (C-1000NF) on commercially batched concretes with a prescription of 435 Kg's cementitious and a 0.40 water to cement ratio which reflects concrete utilized in area where durability is a concern.

The concretes selected included supplementary cementitious materials (fly ash and slag) to represent concretes typically used in durable structures.

This abstract outlines the results of the plastic and hardened state properties of the concretes researched. This research was carried out by The Australian Centre for Construction Innovation (ACCI/UNSW). The properties reported in this abstract include **slump**, **setting time**, **compressive strength**, and **drying shrinkage**.

2. MATERIALS

The three types of cement used were:

- A. AS3972 Type-GB with 25% fly ash (AS3582.1 or ASTM C618 Class F);
- B. AS3972 Type-GB slag blend with approximately 38% slag (AS3582.2);
- C. AS3972 Type-GB slag blend with approximately 60% slag (AS3582.2).

AS1478.1 Type-WR (neutral set) admixture was added as required to target a slump of 80mm. Xypex Admix C-Series which complies to AS1478.1 Special Purpose Admixture Type-SN, dosed at 0.8% or 1.2% in accordance with manufacturer's directions.

3. TEST RESULTS AND DISCUSSIONS

Test results are summarized and shown in Table 3-A.

Table 3-A Summary of Test Results

Mix Code	W/C Ratio	Cement Type and Content (kg)	Xypex Admix C-1000NF (% of Cement Content)	Slump (mm)	Setting Time	Compressive Strength			Drying Shrinkage
						3 days	28 days	91 days	
2FA1	0.40	25% FA (435)	Nil	95	Control	21.9	36.2	46.7	719
2FA2	0.40	25% FA (435)	0.8%	105	+ 2.2~2.5 hrs	22.1	44.1	53.8	577
2FA3	0.40	25% FA (435)	1.2%	100	+ 1.4~2.3 hrs	28.0	47.5	58.0	562
2LS1	0.40	38% Slag (435)	Nil	95	Control	28.1	49.9	64.8	814
2LS2	0.40	38% Slag (435)	0.8%	100	+ 2.2~2.7 hrs	28.6	52.7	65.7	689
2LS3	0.40	38% Slag (435)	1.2%	90	+ 4.0~4.1 hrs	28.6	52.9	66.3	711
2HS1	0.40	60% Slag (435)	Nil	100	Control	14.2	38.1	49.3	803
2HS2	0.40	60% Slag (435)	0.8%	125	+ 0.8~1.6 hrs	12.4	36.5	47.8	772
2HS3	0.40	60% Slag (435)	1.2%	95	+ 1.0~1.3 hrs	15.7	42.0	53.4	772

3.1 Slump (AS1012.3):

Compared to the control slumps were within the normally acceptable range with the exception being Mix-2HS2.

3.2 Setting Time (AS1012.18):

Xypex Admix C-Series modified concrete exhibited extensions in setting time when compared to the control. The results of Mix-2LS3 are inconsistent with the other results.

3.3 Compressive Strength (AS1012.9):

Overall, Xypex Admix C-Series concretes exhibited higher compressive strengths when compared to the controls with the exception of Mix-2HS2. All mixes at 91 days demonstrated continued strength gains.

➤ **Xypex Admix C-Series modified Type-GB (25% fly ash) concrete:**

At age of 28 days, mixes recorded up to 31% higher strengths than the control;

➤ **Xypex Admix C-Series modified Type-GB 38% slag concrete:**

At age of 28 days, compressive strengths showed an increase of 6% over the control;

➤ **Xypex Admix C-Series modified Type-GB 60% slag concrete:**

At age of 28 days, compressive strengths were higher than the control by up to 10%;

3.4 Drying Shrinkage (AS1012.13):

Drying shrinkage results of all Xypex C-Series treated mixes exhibited improved performance. In particular, results for the fly ash mixes showed significant reduction in shrinkage.

➤ **Xypex Admix C-Series modified Type-GB (25% fly ash) concrete:**

At 56 days, mixes recorded lower shrinkage of up to 22% compared to control.

➤ **Xypex Admix C-Series modified Type-GB 38% slag concrete:**

At 56 days, mixes recorded lower shrinkage of up to 15% compared to control.

➤ **Xypex Admix C-Series modified Type-GB 60% slag concrete:**

At 56 days, mixes recorded lower shrinkage of up to 4% compared to control.

4. CONCLUSIONS:

Test results confirm that Xypex Admix C-Series was compatible with both fly ash and slag blended cement concretes which also contained a typical neutral set water reducing admixture. Overall, Xypex Admix C-Series has demonstrated improvements with no adverse effects on general properties of concrete in both its plastic and hardened state. Results indicate improvement in both shrinkage and compressive strength may be achieved with Xypex Admix C-Series.